News-finds-me Perception and News Consumption Behavior in an Algorithmic Environment: An Empirical Study on Algorithmic Involvement in China

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Abstract

Algorithms have been applied in many aspects of news, especially in news recommendation. This study adapted the concept of news-finds-me perception, which is users' perception that they can be informed about the information they need without any seeking behaviors, into an algorithmic news environment. By developing the three sub-dimensions of not-seeking, being-informed and perception of algorithmic curation, the study examined the direct and indirect influence of news-find-me perception on algorithmic news consumption behaviors. Based on an online survey of 300 users of *Headlines Today*, the most popular algorithm-based news application in China, this study showed a direct association between news-finds-me perception and algorithmic news consumption behaviors, and also an indirect association by mediation through intrinsic involvement. Unlike the traditional motivation-stimulated news consumption pattern, this study implies a new mode of algorithmic news consumption in which the consumptive behavior can be influenced by perceptions from a peripheral path. The theoretical and practical implications are discussed.

Keywords: news-finds-me perception, news consumption, intrinsic involvement, algorithmic news recommendation

Introduction

An algorithm, as a technical notion in computer science, is a chain of planned instructions working in a sequential order to output results (Knuth, 1998). By now, life is so mediated by algorithms that almost every shopping recommendation we receive, every news feed appearing on a mobile phone, and every chatbot is the product of an algorithm. According to Bucher (2018), we live in a programmed sociality in which the outputs from algorithms are so ubiquitous that social scientists have begun to think about how algorithms influence society. However, studying algorithms is never simple work. Algorithms are never finished. Algorithms are ongoing processes between engines and users, and users' feedback or social forces will drive new versions of the algorithm for a specific product (Mager, 2012). Needless to say, the multiplicity of algorithms makes it necessary to study each type of algorithm (Bucher, 2018). Moreover, how algorithms work is a black box for most people, and obtaining access to the formulation of algorithms can be difficult (Kitchin, 2017). Technologies can reduce algorithms to a chain of codes, but neglect the interaction between users and algorithms (Bucher, 2018). Social scientists pay more attention to how algorithms influence society and how people interact with algorithms in this programmed sociality (Barocas, Hood, & Ziewitz, 2013).

Like other technologies, algorithms also experience the process of domestication. Domestication originally referred to the process in which technologies entered the home and were used by people in daily life. However, in domestication, all users make the technologies their own, imbuing them with additional meaning that the technology designers could not have expected (Silverstone, Hirsch, & Strathern, 1994). Algorithms are unexceptional. Users will never adopt algorithms passively or accept all information provided by algorithms. Users also personalize and opine about algorithms in order to domesticate them, just as with other

technologies (Gillespie, 2014). For instance, users can make algorithmically recognizable content (causing it to be recommended by algorithms of platforms) in the hopes of being amplified by algorithms (Gillespie, 2017) . This kind of domestication can be regarded as a part of the interaction between users and algorithms. This interaction between algorithms and users, as an everyday phenomenon, has been studied by many scholars (e.g., Bucher, 2017; Witzenberger, 2018). One typical issue of discussion is how users become aware of algorithms, and how this awareness can influence our metadata production as input, and therefore influence algorithmic decision making.

Algorithms influence almost every aspect of our society, and news production comes first, as algorithms influence almost every part of news distribution today (Zamith, 2019). Against the background of information overload, a typical adoption of algorithms in news production is to use algorithms to choose what is newsworthy and curate news feeds for the personalized recommendations (Thurman, Lewis, & Kunert, 2019). To some extent, the role of gatekeeper is released to algorithms and they are allowed to customize the news feed users receive (Beam, 2014). In this process, news consumption in the algorithmic environment is not only a consumptive behavior. It also provides feedback to algorithms and helps them adjust the news feed users will receive in the future. In most news consumption studies, audiences are treated as active consumers of media and they are always purposive and goal-oriented, with strong motivation (e.g., Hastall, 2009; A. M. Lee & Chyi, 2014). However, with algorithmic news recommendation, audiences might not follow or subscribe to news producers actively, but perceive that they are calculated by algorithms and consume the news recommended. This does not mean the selective exposure disappears. The selection still exists but in a more invisible way, as the users will give feedback to the algorithmic mechanism to express “I (don’t) like it”. The

purposes of this study are to provide insight into a new mode of news consumption in an algorithm-mediated news environment by introducing the concept of news-finds-me perception, which describes the extent to which individuals believe that the daily public news can find them without any seeking behavior of their own in social media (Gil de Zúñiga, Weeks, & Ardèvol-Abreu, 2017), and to establish a framework that explains how NFM perception in an algorithmic news environment influences algorithmic news consumption behavior.

Headlines Today is a news aggregator in China. The number of daily active users of *Headlines Today* hit 120 million in September 2017 in China (He, 2017, September 6). The slogan of *Headlines Today* is "the headline is what you care about", and the aggregator uses algorithms to customize the personalized top headlines for every user (Dudarenok, 2019, October 6). The popularity of *Headlines Today* in China makes it a good case study for algorithmic news consumption behavior.

Literature review

News-finds-me perception

News-finds-me (NFM) perception was defined by Gil de Zúñiga et al. (2017) as the extent to which people believe they can be informed about public affairs without following the news actively. When Gil de Zúñiga and his colleagues first proposed it, NFM perception was the idea that people feel that they can stay informed as they maintain connections with friends on social media platforms. Song, Gil de Zúñiga, and Boomgaarden (2020) developed the scale of NFM perception in the social media context. The NFM perception was composed of three sub-dimensions: a) being informed (epistemic); b) not seeking (motivational); c) reliance on peers

(instrumental dimension). This study attempts to apply NFM perception to an algorithmic news environment.

The three dimensions of NFM perception can also be available in the algorithm-mediated environment. The working mechanism of algorithms in news recommendation is to provide personalized content by calculating the information of users themselves. In this way, algorithms curate the information users receive, but the users rarely seek the news or follow news producers actively. However, not seeking actively does not mean that users will not understand that their news is provided by algorithms. As Bucher (2017) mentioned in her work, users will form vague ideas about algorithms as they encounter algorithms every day.

Also, users of algorithms will be provided with the information they need as algorithms calculate their profile and behavioral data and then output the personalized news feed. As a knowledge logic, algorithms have already been a key feature of our information system (Anderson, 2011; Gillespie, 2014). Online news has already proved an influential way for people to acquire public affairs knowledge (e.g., Eveland Jr. & Cortese, 2004). Take *Headlines Today* as an example: Cui and Wu (2019) have found that using algorithm-mediated news aggregators like *Headlines Today* can work well in informing the public.

Furthermore, in the context of algorithmic news recommendation, the instrumental dimension of the perception of reliance on peers in NFM perception should be replaced by the perception of algorithmic curation. Curation is the discriminate selection of materials for display (Davis, 2017). For news, news curation refers to what news is selected and in what order the news will be displayed. On the platform of social media, the reliance on peers in NFM perception means people have a perception that the information they need will be curated by their friends, while in the context of algorithmic news recommendation the role of curation is

played by algorithms. A measurement of the perception of algorithmic curation is to examine how well users can perceive the inherent logic of an algorithm's selection and organization of information. To develop the dimension of the perception of algorithmic curation, the study goes back to the concept of affordance. Perceived affordances refer to design choices that serve as more direct communication between the designer and the user (Faraj & Azad, 2012). When designing technologies, the technical designer will create some features for users to perceive and use, and these features embody the values of the technology. Algorithms are no exceptions, as the features designed in algorithms embody algorithmic values, which means the inherent logic of algorithmic recommendation (DeVito, 2017). In the role of curator, algorithms replace the editors of the classical editorial era and decide on what is new, interesting, newsworthy and relevant to their audiences (Gillespie, 2014; Tufekci, 2015), displaying the relevant information in the form of the news feed. According to DeVito (2017), the values of algorithms include: explicitly expressed interest, the interests of users labeled in their profiles; implicitly expressed interest, the interest deduced by algorithms from the users' input; negatively expressed interest (the "not interested" tool, for example); content quality, which refers to the attributes of the content like timeliness, with likes and reposts by others, and so on (Kacholia, 2013); and status updates providing data such as geographical location. When people perceive that their news feeds are selected and organized according to these algorithmic values embodied in the design of algorithms, they will form the perception of algorithmic curation.

The variable of NFM perception is formed by the three dimensions of not-seeking, being-informed and the perception of algorithmic curation. The three dimensions work together to measure the news-finds-me perception.

Algorithmic news consumption behavior

Algorithmic news recommendation is a consequence of information overload. Information overload refers to the notion of receiving so much information that individuals have insufficient capacity for information processing (Thorson, Reeves, & Schleuder, 1985). The perception of information overload will occur when a) the amount of information that must be processed is too large (Grisé & Gallupe, 1999), b) the information may not be that relevant to the individual (Ho & Tang, 2001) so that it becomes boring, and c) the information is not well organized (Ho & Tang, 2001). Many strategies for handling information overload have been implemented. In the context of online news, technologies that are capable of offering personalization and customization have been applied to reduce the amount of information, making the information more relevant to users (Davenport & Beck, 2000). Algorithms, as a kind of technology that has been used to decide on what is relevant to users (Gillespie, 2014) and organize the information, are a typical tool (Thurman et al., 2019).

Another issue of information overload is the change in news consumption patterns. Before the era of information overload on the Internet, news consumption was always associated with the frequency of usage or the number of news subscriptions (S. K. Lee, Kim, & Koh, 2016). But against the background of information overload, the study of news consumption cannot be reduced to studying usage, subscription or purchase, but should pay more attention to the concrete news consumption behaviors and patterns. According to S. K. Lee et al. (2016), possible news consumption behaviors against a background of information overload include news avoidance, selective exposure and willingness to pay for news. News avoidance is a consumptive behavior wherein news consumers tend to avoid news materials, both intentionally and unintentionally, when feeling information fatigue. Selective exposure is a news consumptive behavior wherein people tend to reduce cognitive dissonance and consume consonant media

materials (F. L. Lee & Yin, 2019). The willingness to pay for news refers to a consumptive behavior wherein users are willing to pay a cost to deal with information overload (S. K. Lee et al., 2016).

In an algorithm-mediated news environment, users can send signals to the algorithmic system through news consumption behaviors like news avoidance, selective exposure and paying for the news recommendation applications. F. L. Lee, Chan, Chen, Nielsen, and Fletcher (2019) mentioned the concept of consumptive news feed curation, which is that users send signals to the platform, and therefore participate in the process of personalization. Algorithm-based recommendation systems can also use the profile of the user and the behavioral data collected from the user (Pariser, 2011). In addition, people's interactions with these algorithmic systems can be a part of the customization of the news feed (Beam, 2014). News consumption behaviors can also be signals. By tagging a piece of news "not interested" or blocking a piece of news, users avoid some news. Through changing his or her profile, the user can be exposed to the information selectively. By paying for algorithm-based news aggregators, users can send signals to an algorithmic system.

The perception of algorithmic curation might influence algorithmic news consumption behaviors. To some extent, algorithmic news consumption behavior, as a kind of algorithmic customization, implies the acceptance and adoption of algorithmic technology. Perceptions, as beliefs about new technology, are associated with the individuals' intention to accept a technology. The perceived relevant advantage (customization, for example), perceived utility and perceived ease of use will predict the adoption of the technology (Chan-Olmsted, Rim, & Zerba, 2013). In the scale of NFM perception in the algorithm-mediated news environment, the perception of algorithmic curation refers to whether people perceive the information they receive

as relevant to the profile and behavioral data they produced before, and it is a kind of customization. News customization causes users to perceive the relevant advantage, and the perception of not-seeking and being-informed can be construed as the perceived utility of algorithm recommendation on informing and the ease of use for not-seeking.

The expected response to NFM perception in algorithms is stated in the first hypothesis (see **Figure 1**):

> **H1**: NFM perception, including the perception of algorithmic curation, not-seeking, and being informed, will predict algorithmic news consumption behavior in the algorithm-mediated news environment.

Currently, there are few studies about the three kinds of news consumption behaviors in the algorithmic news environment. Studying how NFM perception affects the three aspects of algorithmic news consumption behavior (news avoidance, selective exposure, and willingness to pay for news) can help us understand the working effect of NFM perception on the behaviors. The first research question is as follows:

> **RQ1**: What is the relationship between NFM perception and the three aspects (news avoidance, selective exposure, and willingness to pay for the news) of algorithmic news consumption behavior?

Intrinsic involvement

In addition to the direct process, the indirect association between NFM perception and algorithmic news consumption behavior is mediated by the intrinsic involvement of users. Intrinsic involvement refers to the extent to which the object in question has personal relevance and significant consequences for the individual (Amoako-Gyampah, 2007). The perception of algorithmic curation promotes the perception of the relevance between the individual user and the algorithmic system, because the algorithmic system uses data relevant to the users

themselves. In the beginning stage of the interaction between the user and the algorithmic system, users might only notice that they are assessed by algorithms and the news feed they receive is curated by algorithms independent of users' involvement with the mechanism of the algorithm. However, the perception of algorithmic curation might have an effect on users' intrinsic involvement because they feel that the data they produced intentionally and unintentionally are relevant to the outcome of algorithmic curation. The study proposed the hypothesis that news-finds-me perception will enhance users' intrinsic involvement.

H2: News-finds-me perception in an algorithmic news environment is positively associated with users' intrinsic involvement.

As an additional factor for the technology acceptance model (TAM), intrinsic involvement was proposed by Jackson, Chow, and Leitch (1997) to explain a person's behavioral intention to use information technology. Intrinsic involvement has been proved to be positively associated with the behavioral intention to use technology (e.g., Amoako-Gyampah, 2007). This study considers the algorithmic news consumption behavior as the adoption of algorithmic news recommendation. Therefore, the third and the fourth hypothesis are:

H3: Users' intrinsic involvement is positively associated with users' algorithmic news consumption behavior.

H4: The association between NFM perception and algorithmic news consumption behavior can be mediated by intrinsic involvement.

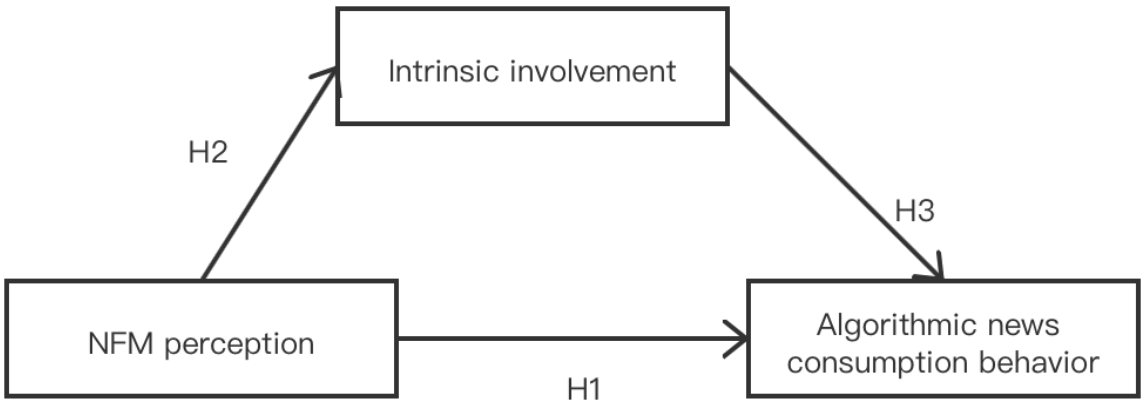

Figure 1. Proposed theoretical model of the NFM perception on algorithmic news consumption behavior.

Method

To test the proposed hypotheses, a survey was administered on a platform called Credamo (credamo.com) in February 2020. Credamo is a crowdsourcing marketplace in China for individuals to hire crowd-workers to complete tasks. To exclude people who were not the users of *Headlines Today*, the questionnaire started with a screening question that asked whether or not a user had used *Headlines Today* in the past year. A sample of 300 people completed an online questionnaire (the descriptive statistics can be seen in **Table 1**). Extra credits were given to compensate for the participants' time and effort in contributing to the survey. The age of the participants ranged from 13 to 66 years, and averaged 29.24 years (SD = 6.88); 51.0% were men and 49.0% were women. The median level of education was a bachelor's degree and the median monthly income was between 4001–6000 Chinese yuan. Compared with the CNNIC survey in April 2020 (CNNIC, 2020), the gender of samples is basically consistent with the national

distribution in CNNIC survey. However, the median level of educational degree was a bachelor's degree while national results in CNNIC survey showed that most netizens in China are junior high school graduates, followed by high school. And the age of samples concentrated on the region of 20-40 years old.

Table1. Descriptive statistics and reliability tests for variables used in the survey (N = 300)

	No. of survey items	Range of scale scores	Mean of sum/ Frequency	Standard deviation/ Percentage	Reliability test statistic (Cronbach's *a*)
Independent variables:					
Not-seeking	4	4–28	13.13	4.96	.801
Being-informed	3	3–21	16.36	3.25	.757
PAC	9	9–63	50.03	6.62	.789
Intrinsic involvement	5	13–35	29.30	3.77	.833
Dependent variables:					
Algorithmic news consumption behavior	12	35–83	59.21	8.10	.721
Control variables:					
Traditional media exposure (frequency)	2	2–14	8.40	2.67	
New media exposure (frequency)	3	10–21	17.94	2.29	
Demographic variables:					
Age	1	13–66	29.24	6.88	
Monthly income	1	2000–16000 yuan	3.89 (between 4001–6000 yuan)	1.75	
Education	1	Min: elementary school Max: doctoral degree	4.62 (around B.A)	.82	
Net age	1	0–30	13.03	5.13	
Gender:					
Male			153	51.0%	
Female			147	49.0%	

The survey elicited information on the participants' news-finds-me perception, intrinsic involvement, and algorithmic news consumption behavior. All questions were asked in Chinese. The measures of each variable are described below:

News-finds-me perception

To test the measurement instrument of NFM perception, a pilot study was conducted before the administration of the survey. After 102 samples were collected, exploratory factor analysis was conducted and some statements were altered. Finally, the sixteen statements were asked in the survey (see **Table 2**).

The questionnaire asked the participants to report their perception of "news-finds-me" while using *Headlines Today* according to the following three dimensions: not-seeking, being-informed, and the perception of algorithmic curation. The questionnaire adapted four items for the dimension of not-seeking and three items for the dimension of being-informed from the items used by Song et al. (2020). Examples of the question items include "*I can get lots of information I need when using Headlines Today*", "*I rarely actively seek information when using Headlines Today*" and so on. In addition, the survey created nine items to measure the participants' perception of algorithmic curation (PAC in short) based on the dimensions of algorithmic value developed by DeVito (2017). Among the nine items, five items were used to measure the perception of expressed interest in the news that users were recommended, three items were used to measure the perception of content quality about the news that they were recommended, and one item was used to measure the perception of the status update when receiving the news recommended by algorithms. The participants were asked to indicate their agreement level with the statements like "*I can feel what Headlines Today recommends to me is relevant to my previous search history*" and "*I can feel that Headlines Today tries to recommend to me content*

with more likes and reposts". The whole scale of news-find-me perception was developed on a seven-point Likert scale ranging from *1 = strongly disagree* to *7 = strongly agree*. The Cronbach's *a* of the three dimensions of NFM perception (not-seeking, being-informed and the perception of algorithmic curation) was equal to 0.801, 0.757, 0.789 separately. The overall Cronbach's *a* of NFM perception was equal to 0.714. The values of the sixteen items were added together and then divided by the number of items to produce the variable of NFM perception.

Before testing the hypothesis, a principal factor analysis was performed to refer to the three parts, which were not-seeking, being-informed and the perception of algorithmic curation (PAC in short) of NFM perception, respectively. By using the Varimax rotation method with measures for the three dimensions, three factors of NFM perception were extracted and the factor loadings were shown in **Table 2**.

Table 2. Factor analysis of the NFM perception items yielding three factors

	PAC	Not-seeking	Being-informed
Q1. I rarely use the function of searching when using *Headlines Today*.	-.167	**.817**	.007
Q2. I rarely use the function of following writers when using *Headlines Today*.	-.094	**.740**	-.097
Q3. I rarely actively seek information when using *Headlines Today*.	-.174	**.782**	-.021
Q4. When I use *Headlines Today*, I only swipe the page to get information for most of the time.	-.067	**.778**	.158
Q5. I rarely worry about acquiring public affairs when I use *Headlines Today*.	.162	.146	**.670**
Q6. I can get lots of information I need when using *Headlines Today*.	.206	-.089	**.857**
Q7. I can keep up with recent Internet events when using *Headlines Today*.	.222	-.002	**.833**
Q8. I can feel that the news *Headlines Today* recommends to me is relevant to the news creators I followed.	**.670**	-.079	.169
Q9. I can feel what *Headlines Today* recommends to me is relevant to the channels I subscribed to.	**.684**	-.097	.190
Q10. I can feel that the news recommended to me on *Headlines Today* is relevant to my previous likes, comments and reposts.	**.682**	-.164	.133

Q11. I can feel what *Headlines Today* recommends to me is relevant to my previous search history.	**.712**	-.174	.036
Q12. I can feel what *Headlines Today* recommends to me is what I recently followed.	**.728**	-.063	.018
Q13. I can feel that *Headlines Today* tries to recommend me content of higher quality.	**.646**	-.114	.057
Q14. I can feel that *Headlines Today* tries to recommend to me content with more likes and reposts.	**.524**	-.170	.332
Q15. I can feel that *Headlines Today* tries to recommend to me the content that is read more by others.	**.596**	-.074	.222
Q16. I can feel what *Headlines Today* recommends to me is relevant to my geographic location.	.**541**	.024	.230

Note: Bold items indicate factor loadings >.50.
PAC = the perception of algorithmic curation.

Intrinsic involvement

The intrinsic involvement index was composed of five items (Amoako-Gyampah, 2007) that asked about the participant's perception of *Headlines Today*'s ability to deliver information in an effective, concise, useful and relevant way. Participants were given on a seven-point Likert scale ranging from *1 = strongly disagree* to *7 = strongly agree*. The five items comprised a reliable measure (a = .833). The five items were added together and then the sum divided by the number of items to produce the variable of intrinsic involvement.

Algorithmic news consumption behavior

As stated in the literature review section, algorithmic news consumption behavior can be composed of three parts: news avoidance, selective exposure, and willingness to pay for the news (S. K. Lee et al., 2016). Four items for each part and 12 items for the variable of algorithmic news consumption behavior was created. The items included statements such as "*I will delete or block some news Headlines Today recommends to me*", "*I will edit the channels I subscribe to in Headlines Today, to acquire news that is more consistent with my interest*", and "*I will pay for the membership service in Headlines Today*" and so on. The participants were asked to indicate

their agreement to these statements on a seven-point Likert scale ranging from *1 = strongly disagree* to *7 = strongly agree.* The 12 items formed a reliable composite measure (a = .721). The 12 items were added and then divided by the number of items to produce the variable of algorithmic news consumption behavior. To test the separate influence of NFM perception on algorithmic news consumption behavior, three other variables were also created: news avoidance (a = .834), selective exposure (a = .718), and willingness to pay for news (a = .903).

Control variables

The study recorded several variables that could affect the algorithmic news consumption behavior, including age, gender, net age, monthly income, level of education (from elementary school to doctoral degree), and general media exposure (i.e., how frequently participants watch TV, read newspapers, use WeChat, Weibo, and *Headlines Today*, on a 7-point Likert scale, *1 = very few, 7 = almost every minute*). For the media exposure, traditional media exposure and new media exposure were calculated separately: the value of how frequently participants watched TV and read newspaper were added together and divided by two (the number of items); the value of how frequently they used WeChat, Weibo and *Headlines Today* were added together and divided by three (the number of items).

Results

Direct process and indirect process

To test the direct and indirect relationship between NFM perception and algorithmic news consumption behavior, the study analyzed the collected data with the aid of model 4 of the PROCESS macro developed by Hayes (2017). After controlling the control variables, the results showed that the NFM perception did have a direct effect (effect = .139, p = .04 < .05) on algorithmic news consumption behavior. With consideration of the mediator, intrinsic

involvement, the total effect of the model was .233 ($p < .001$). The indirect effect of NFM perception on algorithmic news consumption behavior equals to .094. Therefore, H4 was supported. The results of process are shown in **Table 3.**

Table 3. Indirect effects for serial mediation model

	Effect	LLCI	ULCI
NFM>ANCB	.139	0.004	0.274
NFM>Intrinsic involvement>ANCB	.094	0.021	0.169
Total Model	.233	0.111	0.356

Note. 10000 bootstrap estimates used to construct 95% confidence intervals. NFM = News-finds-me perception, ANCB = Algorithmic news consumption behavior.

Regression analysis

The results of the regression analysis are shown in **Table 4**. H1 predicted a direct association between NFM perception and algorithmic news consumption behavior. The results showed that the regression coefficient was statistically significant ($B = .12$, $p < .05$). Therefore, H1 was supported. In the indirect relationship, intrinsic involvement was significantly associated with NFM perception ($B = .39$, $p < .001$), which in turn was significantly associated with algorithmic news consumption behavior ($B = .20$, $p < .01$). Therefore, H2 and H3 were both supported.

As is shown in **Table 4**, the coefficients of NFM perception towards news avoidance and selective exposure are larger than the coefficients of NFM perception towards the willingness to pay for news. The difference suggests that when perceiving “news-finds-me” in the algorithmic news environment, news avoidance and selective exposure might be triggered more significantly than payment behavior.

Table 4. Regression analysis predicting algorithmic news consumption behavior

Blocks/Variables	Intrinsic Involvement	News avoidance	Selective exposure	Willingness to pay for the news	Overall algorithmic news consumption behaviors
	Beta	*Beta*	*Beta*	*Beta*	*Beta*
Block 1					
Gender (male = 1)	.00	.16**	.11*	.04	.17**
Age	.10*	-.21**	-.15**	.02	-.20**
Net age	-.03	.28***	-.06	-.12*	.07
Monthly income	.06	-.06	-.03	.21***	.09
Education	-.04	-.02	-.03	-.06	-.03
Incremental R^2	5.6%	13.0%	3.9%	12.3%	7.4%
Block 2					
Traditional media exposure	.20***	-.03	.15**	.26***	.21***
New media exposure	.38***	-.02	.17**	.24***	.20**
Incremental R^2	23.6%	1.1%	16.1%	24.2%	15.9%
Block 3					
NFM perception	.39***	.17**	.16**	-.08	.12*
Incremental R^2	14.1%	1.0%	7.4%	0.1%	3.5%
Block 4					
Intrinsic involvement	-	-.18*	.32***	.30***	.20**
Incremental R^2	-	1.9%	5.9%	5.2%	2.3%
ANOVA results (*F*)	27.74***	6.57***	16.08***	23.14***	13.26***
Total R^2 (%)	43.3%	16.9%	33.3%	41.8%	29.1%
Total adjusted R^2 (%)	41.7%	14.4%	31.2%	40.0%	27.0%

Notes: Entries are standardized regression coefficients.
*By means. N =300. *p <.05; ** p <.01; *** p < .001.*

Overall, the **Figure 2** shows the relationships between the main variables in this study.

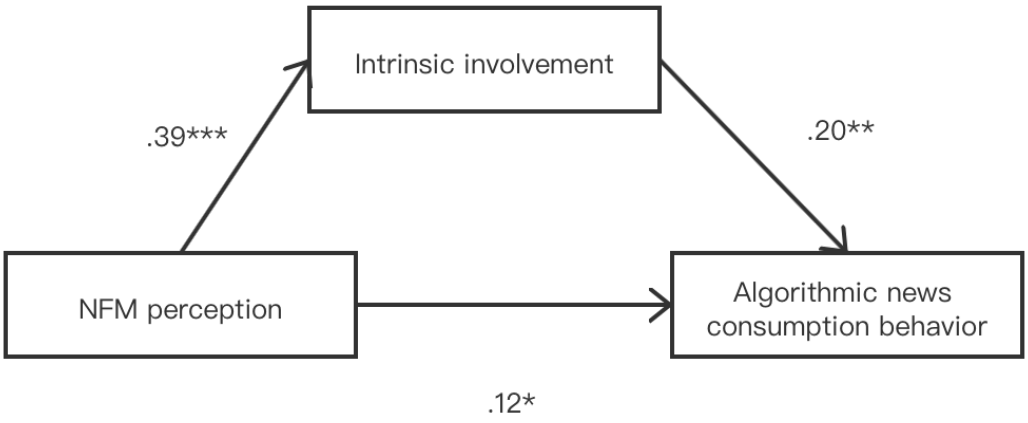

Figure 2. The regression analysis of the effects of NFM perception on algorithmic news consumption behavior. The coefficients are standardized. All solid-line arrows are significant at $p < .05$ or better. *p <.05; ** p <.01; *** p < .001.

Discussion and conclusions

Theoretical implication

The conceptualization of NFM perception adapted from the original concept in the context of social media platforms (Gil de Zúñiga et al., 2017; Song et al., 2020) to the algorithm-mediated environment represents an advance in relevant algorithmic awareness studies. Firstly, most previous studies on algorithm awareness are qualitative (e.g., Bucher, 2017; Eslami et al., 2015; Klawitter & Hargittai, 2018), using the method of interviews with users or technical engineers. However, few scales have been developed to measure users' awareness of algorithms. Moreover, when it comes to the involvement of users into algorithms, most previous studies focused on the emotional response, using affective words likewise skeptical (e.g., Fletcher & Nielsen, 2019) and trustful (e.g., Wölker & Powell, 2018) to sum up users' emotional response in the algorithmic involvement. Combined with the algorithmic values, which is the inherent logic of recommendation of algorithms (DeVito, 2017), this study attempted to build the measurement of users' logical involvement within the conception of algorithmic curation because the users can

perceive the recommendation logic of algorithms. The logical involvement is more consistent with algorithms' role as a delegate to navigate the news feed (Willson, 2017) because it considers the affordances of algorithms.

Algorithmic news consumption's pattern

Based on the conceptualization of NFM perception, the study examined the effects of NFM perception in algorithmic news recommendation on algorithmic news consumption behavior. The results showed that news-finds-me perception did have a direct effect on news consumption behavior in the algorithmic environment. The study revealed a different pattern of news consumption than the motivation-behavior path. The second line of cognitive psychology might provide an explanation for the effects of NFM perception. The second line (compared with the first line which emphasizes the basic mechanisms influencing human functioning microanalytically) focuses on the working systems of situated factors on human behaviors (Bandura, 2001). Human behaviors are not only motivated by external stimulus but also influenced by the internal conduit between the external information and the human brain peripherally. In this study, algorithms act as a kind of internal conduit, having effects on end users' behaviors.

Another interesting finding is that the coefficients on news avoidance and selective exposure are quite significant. The finding is consistent with studies on the echo chamber (Jamieson, 2008). Social media algorithms have been considered as a factor in reducing users' exposure to information with different attitudes (Bakshy, Messing, & Adamic, 2015). Algorithms also work this way in the acquirement of news. After perceiving that the algorithms can get news to them without any seeking behavior, the users will take advantage of the technology to access news selectively.

Intrinsic involvement in algorithmic environment

The mediating role of intrinsic involvement between NFM perception and algorithmic news consumption behavior can be compared with the role of outcome-relevant involvement in persuasion (Johnson & Eagly, 1989). The outputs of algorithms (in this case, the news recommended by algorithms) provide users the information they need and then help to shape a sense of self-relevance. The outcome-relevant involvement tends to cause people to change their attitudes and take action (news consumption behavior, in this case). The more self-relevant the users feel, the more intrinsic involvement they experience, and the more consumptive-customization behaviors they will have.

Limitations and future research

The model in this study is actually a cyclic process, in which the algorithmic news consumption behaviors might also enhance the news-finds-me perception. This influence is cyclical and inescapable, and will always be a part of the algorithmic mechanism.

In addition, some of the findings of this study may be context-specific. The study discussed the algorithmic perception from the perspective of affordance, but there is no way to know whether the affordance is the affordance of algorithms or the affordance of the *Headlines Today* application. Considering the multiplicity of algorithms, though this study tries to develop the concept of NFM perception in algorithmically-recommended news, the extent to which the research experience can be promoted is worth discussing. How to find a balance between the individual cases of algorithmic operation and the application of theory is also a question to be considered.

As a knowledge logic (Gillespie, 2014), algorithms decide what deserves to be known and what is relevant. However, in this process, users also participate in the computation of

algorithms in the form of data production. By adjusting our news consumption behavior, users can co-curate the information they receive. For the working process of algorithms, it should be noted that the outcomes of algorithms may be heavily impacted by the power of tech giants and government (e.g., Caplan & Boyd, 2018). In other words, the information users receive in *Headlines Today* is the production of co-work by algorithms, users themselves, the tech company and the government. But to what extent does the "co-work" collaborate? The role of users, technology, tech-giants and government in this "co-work" process is worthy of further investigation.

Moreover, this study surveyed only 300 samples and the samples were not national quota. The online survey made the 300 samples collected more concentrated on the age between 20 to 40 years old, with higher average educational degree, which might affect the results. Future studies should obtain a larger sample and approximate China's latest census demographics overall.

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